



Contents lists available at ScienceDirect

## Environmental Development

journal homepage: [www.elsevier.com/locate/envdev](http://www.elsevier.com/locate/envdev)

## Gendered vulnerability and adaptation in Hindu-Kush Himalayas: Research insights

Chanda G. Goodrich\*, Anjal Prakash, Pranita B. Udas

*International Center for Integrated Mountain Development, Nepal*

### ARTICLE INFO

**Keywords:**

Hindu Kush Himalaya  
Gendered vulnerability  
Intersectionality  
Climate change

### ABSTRACT

Vulnerability to climate change is a multi-layered and multi-faceted phenomena, determined by both biophysical and socio-economic factors, leading to differential vulnerabilities for women and men from different categories, groups and locations. Thus, there are varying gendered differences in vulnerabilities in any context, and not all women or all men are equally vulnerable, nor are they vulnerable in a similar way – vulnerabilities vary in nature and type. Vulnerabilities to climate change are often studied in isolation and compartmentalization of the various inter-linked contextual conditions (e.g. social and gender, political, economic and geographical/location) and other socio-economic drivers of change, such as globalisation, urbanization, technological and infrastructure development. However, climate change vulnerabilities are manifestations of interlinkages and an intersecting of the contextual conditions and socio-economic drivers of change against the backdrop of climate change. This thematic issue brings together studies on these aspects of intersectionality of the contextual conditions and drivers of change, which leads to various manifestations of gendered vulnerabilities, adding to the current knowledge on gender and climate change vulnerabilities especially from the HKH region perspective.

### 1. Introduction – HKH a hot spot

Hindu Kush Himalaya (HKH)<sup>1</sup> where the 10 river systems originate through the highest peaks of the world is an important mountain system spread over eight countries of the world, directly supporting livelihoods of about 3% population of the world (Rasul, 2014). The resources that originates from this mountain system support another 17% of the world population living downstream of the region (ICIMOD, 2015). In the changing climatic scenario, that is threatening the mountain ecosystems including water systems, especially high elevation biota that includes forest, agro-biodiversity, range and pasture ecosystems, HKH is noted to be a major hotspot for climate change (Stocker et al., 2013; De Souza et al., 2015) and marked out as a “risk hotspot” for climate-induced

\* Correspondence to: GPO Box 3226, Lalitpur, Nepal.

E-mail addresses: [Chanda.Goodrich@icimod.org](mailto:Chanda.Goodrich@icimod.org) (C.G. Goodrich), [Anjal.Prakash@icimod.org](mailto:Anjal.Prakash@icimod.org) (A. Prakash), [Pranita.Udas@icimod.org](mailto:Pranita.Udas@icimod.org) (P.B. Udas).

<sup>1</sup> HKH region and adjacent mountain areas include: Afghanistan – all provinces except Kandahar, Helmand, Nimroz, Farah, and Herat; Bangladesh – Chittagong Hill Tracts; Bhutan – whole country; China – parts of Yunnan (Diqing, Nujiang, Dali prefectures), Sichuan (Ganzi, Aba, Liangshan prefectures), Gansu (Gannan, Wuwei, Zhangye prefectures), Xinjiang (Kashgar, Kezilesu, Hetian, Altai prefectures), whole of Tibet Autonomous Region and Qinghai; India – the 11 mountain states (Arunachal Pradesh, Himachal Pradesh, Jammu and Kashmir, Uttarakhand; Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura) and Darjeeling district of West Bengal; Myanmar – the states of Kachin, Chin, Shan and Rakhine; Nepal – whole country; Pakistan – North Western Frontier Province (NWFP), Federally Administered Tribal Areas (FATA), Northern Areas, Ajad Jammu and Kashmir (AJK), and 12 districts of Baluchistan].

<https://doi.org/10.1016/j.envdev.2019.01.001>

Received 30 November 2018; Received in revised form 8 January 2019; Accepted 8 January 2019  
2211-4645/ © 2019 Published by Elsevier B.V.

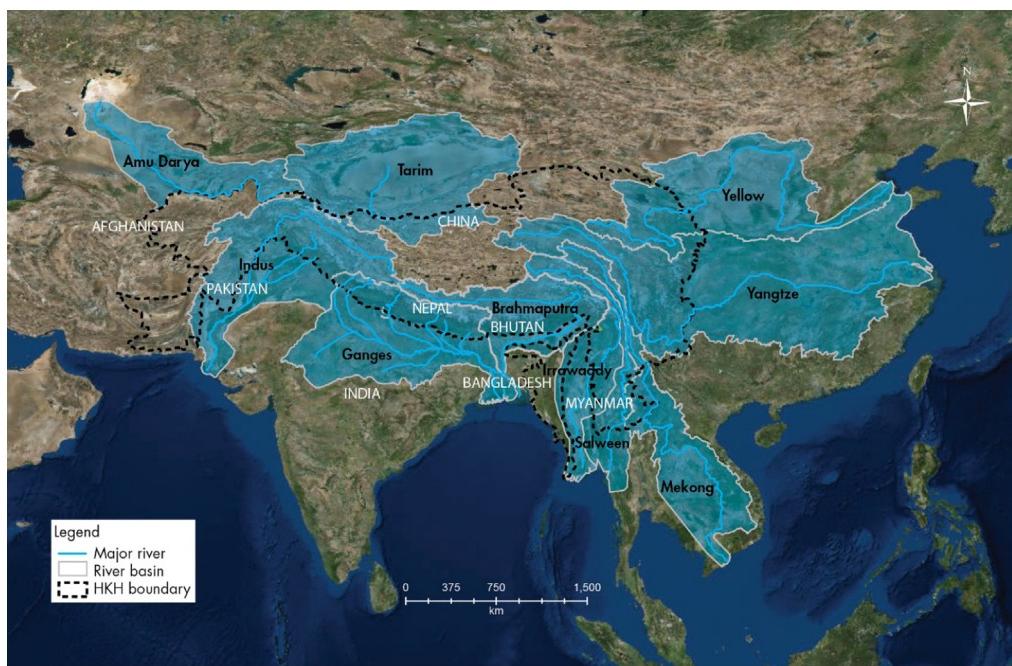
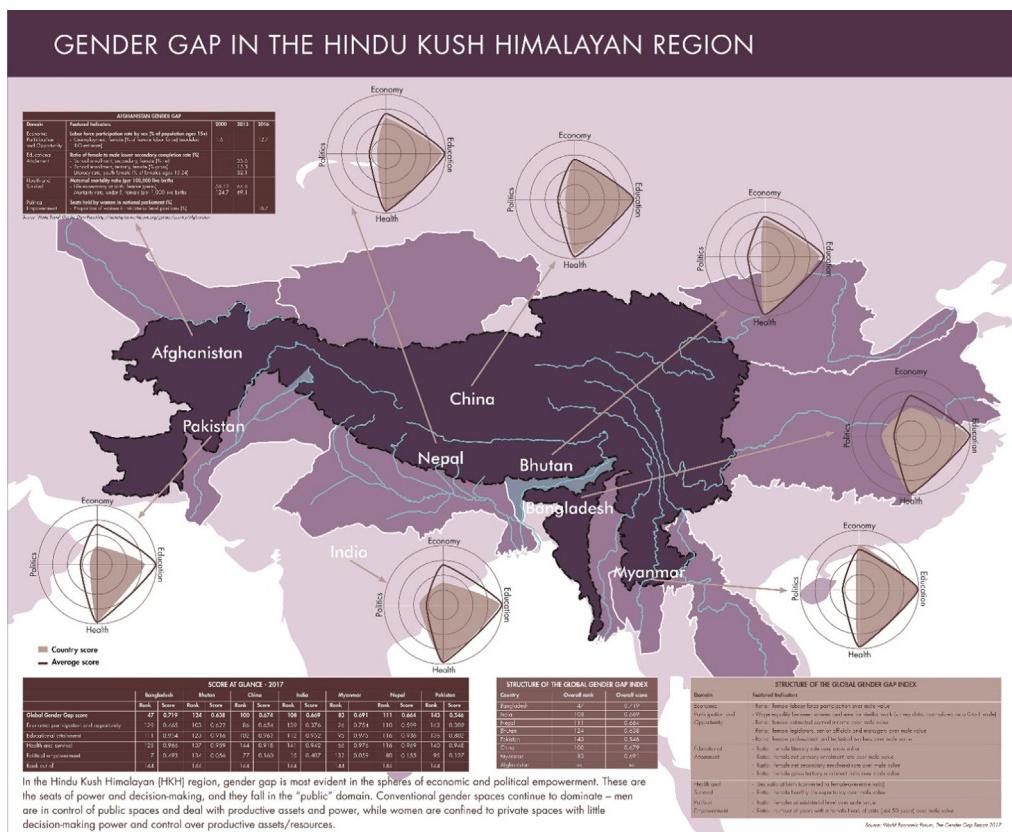


Fig. 1. Hindu Kush Himalaya.



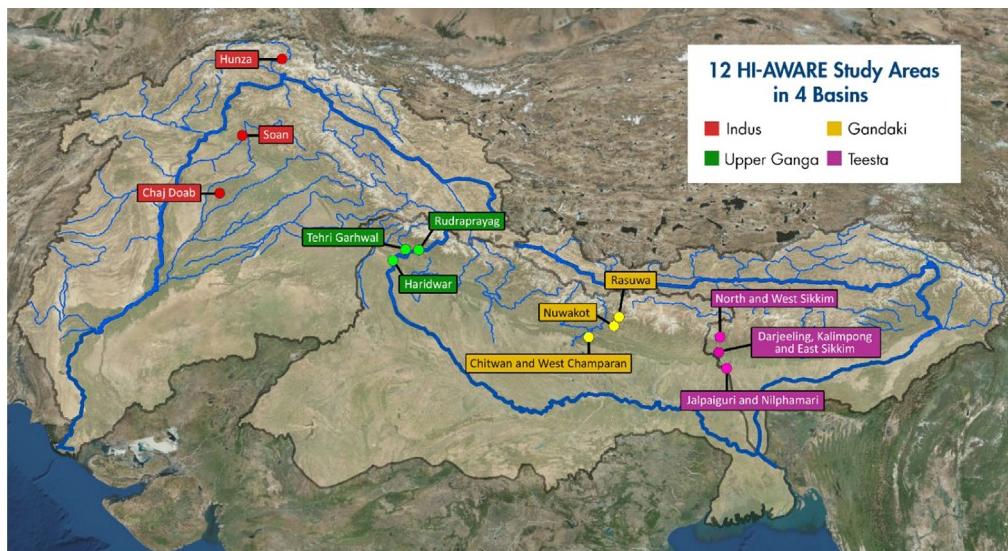


Fig. 3. Map of the study areas/sites.

hazards and disasters (Tucker et al., 2015; Kilroy, 2015; Behrman, 2010) (Figs. 1–3).

The global temperature rise by 1.5 °C by the end of 21st century mean temperature rise in HKH by 2.1 °C (Kraaijenbrink et al., 2017). It is estimated that the increase temperature not only melt one third of total ice volume in the region by the end of the century, but also affect availability of water sources, crucial for lives and livelihoods (Wester et al., 2018). The increased glaciers melt is expected to form new lakes and change land covered by snow and other natural resources (Lutz et al., 2016) Moreover combined effect of snow melt, heavy rainfall in monsoon and dryness in winter is increasing water related disaster like flood, landslides and drought (Lutz et al., 2018).

Apart from climatic changes, there are rapid socioeconomic changes too in this region. For instance, road connectivity has exponentially increased within a decade that has increased human mobility, especially for men. As a result, there is a growing trend of mountain villages being populated with left behind women, children and senior citizens (Speck, 2017). Mountain people are better connected through the reach of mobile phones and internet facilities that make people easy to explore opportunities not only within their localities but even outside. Feminization of demography with increase in women's engagement in farming in many places are obvious (Kelkar, 2009). Increased economic activities in some villages has resulted into rapid urbanization with uncontrolled population growth in the HKH landscapes whereas some other villages are deserted due to water scarcity, farm failures, lack of infrastructures and economic opportunities (Khanal and Watanabe, 2006). Thus, across the HKH there is high population growth, changing demographics associated with rural-to-urban migration, along with urbanization (that is often unplanned), economic liberalisation and free market policies, which are leading to a rising consumer culture even among rural populations and having a detrimental impact on natural resource bases (Goodrich et al., 2017).

Mountain people in the HKH face harsh environmental and climatic conditions as well as difficult geographical terrains, resulting in low population density compare to plains. Mountain poverty is high due to lack of infrastructure and services on health, education and other livelihood (Gerlitz et al., 2011) People in mountain are more vulnerable due to climatic variability as it has direct impact on biophysical resources upon which people are dependent. Thus, poverty, living in marginal and fragile environments, having limited access to material, social, economic and political resources (including skills and technologies), few income earning possibilities, and limited ability to diversify or adapt in difficult circumstances, infirmities and conditions of disability, and life cycle positions contribute to make mountain people less resilient and less able to cope with and adapt to crisis situations (Pasteur, 2011).

In the changing climatic and socioeconomic context, the demographic mosaic on differential levels of vulnerabilities and well-being have been further widened among the mountain people. The fault line of these differences are along the axes of gender, caste, class, ethnicity, age, health status, geolocation, political affiliation, etc. All the countries in HKH commit to achieve greater equality among its citizens, minimising the level of poverty and hunger through action that responds to vulnerabilities so as to achieve Sustainable Development Goals (SDG). The development initiatives targeted earlier to meet Millennium Development goals show progress to some extent, yet indicate more needs to be done to achieve the SDGs. Except China with Human Development Index (HDI) rank of 90, the remaining seven countries within HKH fall within HDI rank 132–169 in 2015 (HDR, 2016). Gender inequality and poverty is high in HKH. Four of the eight countries in HKH has Gender Development Index value under low equality group, indicating HDI achievements between women and men with absolute deviation from gender parity of more than 10%. None of the countries in HKH is in the high equality group (HDR, 2016). Similarly, women of HKH countries have limited opportunity of build livelihood capitals. Their economic participation, as well as access to education is low. For example, in Afghanistan, female to male ratio of secondary level school enrolment is only 35.6%, which drastically decrease at tertiary and higher levels (World Economic Forum, 2017).

One of the reasons for lower success on achieving equality is the complexity of the issues as well as persisting gender bias in the society. Gender, poverty and equity are complex issues which is difficult to concretely address in plans and programs. Gender and social issues are dynamic and addressing them effectively in development plans and programs require updated knowledge on what is happening in the field. Far too often development practice and programs either revolve around technocratic programs typically addressing women's practical gender needs only or including women in economic development. Such practices associate women's needs and aspirations as small in size and subsistence-oriented. Although these are important entry points and also present economic opportunities for women, they often do not fully address their unequal power relations with men, nor question the gender division of labor or access to resource rights and ownership, which are so critical to women's empowerment and ultimately to transformative change. (Resurrección et al., 2019, p. 512). At the same time the impact of climate change is equally complex. Elalem and Pal (2015) argue that complex interactions between natural and socio-economic conditions play a dominant role to define and characterize the type and magnitude of vulnerability of HKH countries to disaster occurrence and their economic and human impacts.

This special issues based on ten articles with empirical evidences from four river basins namely Indus, Upper Ganges, Gandaki and Teesta in Brahmaputra under Himalayan Adaptation and Water Resilience Research (HiAWARE)<sup>2</sup> carried out by consortium of International Centre for Integrated Mountain Development (ICIMOD), Pakistan Agriculture Research Council (PARC), The Energy and Resources Institute (TERI) and Bangladesh Centre for Advanced Studies (BCAS) aims to provide latest understanding on issues around gender and vulnerabilities in the context of climate change in HKH. Inspired by anthropological participatory research methods, the field study was conducted between 2015 and 2017 in 12 study sites through three tiers of field investigations, respectively for situation analysis, identification of socioeconomic drivers and conditions leading vulnerabilities and on gendered vulnerabilities. Based on the conceptual framework of gendered vulnerability given in the paper by Goodrich et al. that takes an intersectionality approach, the research in the different sites used participatory anthropological tools in which gender is studied as intersecting with other key social fault lines such as class, caste, ethnicity, and other dimensions of marginality based on location and political environment/situation.

This introduction outlines the major issues with regard to gendered vulnerability in Hindu-Kush Himalayan regions, the major findings and also outlines knowledge gap on understanding gendered vulnerabilities in climate change context and provide overview of papers in this issue.

## 2. Gendered vulnerabilities

Discussions and analysis of climate change always talk about vulnerability, which is related to other terms such as risk, exposure, sensitivity, resilience and adaptive capacity. These terms, when used in the more restrictive bio-physical discourse on climate change do not necessarily emphasize the differentiation amongst and within communities. However, since the 1990s, with the established of the definitions of social vulnerability concept and the differentiated impacts of climatic hazards, there has been much efforts in understanding differential impacts and who are the most vulnerable. Therefore, spatial location, social aspects, viz. socio-cultural practices and norms, as well as institutional, political and economic factors defining who has entitlements to resources and assets and who is excluded from them, are key to vulnerability (Eakins and Luers, 2006; McOmber et al., 2013; Scoones, 2009; Blaikie and Sadeque, 2000; Blaikie et al., 2014). Gender is a critical dimension that cuts across all these markers of vulnerability. Gender further intersects with other key social fault lines such as class, caste, ethnicity, age, and other forms of marginality to shape the extent to which people can manage and cope adverse situations without suffering long-term or irreparable losses to their livelihood and well-being (Nelson and Lambrou, 2008; Das, 2009). Gender-differentiated roles and responsibilities, rights, access, knowledge and priorities shape vulnerabilities, often resulting in women suffering disproportionately because of socioeconomic constraints and inequalities (Brody et al., 2008; Parikh, 2007). Thus, gendered vulnerability is based on four major situations and conditions - Work types and spaces of men and women, Inequities in access and control over assets and resources, Gender division of roles and responsibilities, and Inequalities in decision-making (Goodrich et al., 2017, p 7–8).

Although on one hand, theory on collectivism and cooperation are based on empirical evidences on livelihoods strategy of mountain people (Ostrom, 2000), on the other hand, social and gender differences in mountain areas are also notable (Sherpa, 2007). Mountain culture are diverse, ranging from family structure of monogamy, polyandry to polygamy in different locations. Researchers argue that such practices emerged with need to manage resources for survival in difficult mountain terrain (Luintel, 2004). However, common to all is the mobility of men in order to manage resources, while women remain relatively stationary taking care of dwellings, children and managing natural resources around the homestead. Thus, the gender division of labor is quite noticeable, where in general men take on tasks in different locations while women spend more time close to dwellings (Hewitt, 1989). Managing immediate resources like water, energy, and providing food, nutrition and health services to children and elderly at home are women's responsibilities. With agriculture and livestock farming being a major livelihood practice in the mountains, these have been affected negatively by climatic stressors, which has further triggered men's movement out of home in search of alternate incomes. In the absence of men, women's work load has increased. In addition, with increased connectivity, globalisation and market penetration there is growing tendency of consumerist behaviour among mountain people in contrast to earlier subsistence livelihoods. As a result, the pattern of nutrition consumption from less processed high value mountain crops is changing to processed and packaged foods (Rasul et al., 2016).

In addition, mountain villages have been part of the discourse and struggle on deprivation and marginalisation at periphery

<sup>2</sup> For more details [www.hi-aware.org](http://www.hi-aware.org).

(Blaikie et al., 2000). Almost all mountain regions of the countries in HKH have experienced political tensions and unrest (ICIMOD, 2011). Sherpa (2007) concludes that in addition to geographical and socioeconomic stressors, political struggle has added new dimension on shaping gendered vulnerabilities in the region. These contextual changes interplay to shape gendered vulnerabilities in HKH, in addition to the persisting inequality resulting from patriarchal systems and gender discriminatory norms and practices that give unequal access and control over resources, and decision making power to women and men.

### 3. Bridging the knowledge gap in gender and climate change: exploration of this special issue

Literature on the issue of gender and climate change focuses on why gender needs to be considered in climate change research, development programs and policies including measures to support people to adapt to changing climate change (Arora-Jonsson, 2011; Nelson et al., 2002; Patt et al., 2009). However, most of the literature on this line focus on disaster as an event to understand gendered vulnerabilities in changing climate context (Enarson and Chakrabarti, 2009; Enarson, 2012; Alway et al., 1998). A major concern in this is that “disasters continue to be seen as the outcomes of ‘natural’ events, to be addressed by relief and rehabilitation, technological solutions and administrative machineries. This has served to overlook long-term climate-resilient development generally and the involvement of local communities in such efforts”. (Goodrich et al., 2017, p. 48). Furthermore, this has also contributed in overlooking the nuanced understanding of how gender vulnerabilities intersect with other dimensions of inequality and marginalisation to produce and shape gendered vulnerabilities to climate change. Thus, there is limited literature that explores interrelation between climate change as gradual change or stressor and gendered vulnerabilities in the context of changing environmental conditions. This issue is more skewed when it comes to gender and climate change adaptation in HKH region.

A major critique of climate change science is that it disconnects knowledge from meaning, i.e. climate change as a knowledge as a global phenomenon has been well accepted as well but it is disengaged from what it means for the people and their experiences (Jasanoff, 2010). This issue tries to address this gap by illustrating the experiences of diverse groups of people in regard to the quality of their lives, livelihoods, and resources due to the changing climate along with specific socio-economic changes in the area.

In this special issue, we have focussed on five major points that adds to the current knowledge on gender and climate change adaptation especially from the HKH region perspective. First, while conceptualizing gendered vulnerability to climate change the issue of intersectionality is important. The issue is not only about women and men as binary groups but also about women and men belonging to different groups and categories. The paper by Goodrich et al. on conceptual framework explores these linkages. Their paper shows that hierarchy of people is largely based on their position in a social and gender structure in a particular location and at a particular time. Understanding the pre-existing contextual conditions underlie experiences of vulnerability and leads to its complexity and reproduction. Gender and other contextual conditions influence, and are influenced by, socioeconomic drivers of change to produce differential gendered vulnerabilities. Understanding of these interlinkages and intersectionalities helps in knowing the nuances of gendered vulnerabilities. Similarly, there is limited contextual understanding on looking at gendered vulnerabilities as an outcome of existing conditions of social and gender structure, geopolitical and socioeconomic factors and external drivers like market, globalisation, infrastructure development and consumerism. The paper by Dilshad et al. on social vulnerabilities in HKH highlights that gender as a social construct is one of drivers of vulnerabilities.

Second, norms and values play an important role in shaping gendered vulnerability. These norms could also be based on different perceptions of risks (Gustafson, 1998) and varies amongst different groups in the social hierarchy (Kapadia, 1995). The paper by Ferdous and Mallick on Bangladesh elaborates this point further. The country is considered one of the most vulnerable under changing climatic conditions. Highlighting the case from lower Teesta region in northwest Bangladesh, the paper shows that these areas are strongly affected by seasonal floods, flash floods, river bank erosion, and drought. In such a situation, it shows how women of *Char* land in flood prone delta of Teesta are the most vulnerable, not simply as a result of their gender roles and responsibilities, but more as a result of discriminatory social norms and practices such as lack of property ownership, lack of education, early marriage, the dowry system, and acceptance of domestic violence against women, which further create barriers to women's mobility and economic empowerment. Women are conditioned to remain at home and not participate, or to wait for men to accompany them to most activities taking place in the public space. Although significant numbers of women have been engaging in income generating activities, creating cooperative funds, and saving money, this is still within the confines of their private space. Government policy to empower women through free education is partly effective but the dominant practice of early marriage and dowry discourage women from coming forward. The study concludes that the prevalent gender discriminatory norms and practices must be addressed to achieve gender transformative change, which is an essential requirement for gender equity and inclusive social development. Government policies and programs, therefore, should be revised to address women's practical and strategic needs for gender transformative change.

Third, as men migrate from villages to cities especially from environmentally stressed regions, women are taking centre stage in production and marketing process. However, markets are one of the most gender unfriendly places where at times, women's personal security is at stake. For women, the existing social norms or stigma generates discrimination and provides skewed access to the market (Esteve-Volart, 2004; McCaffery, 1993). The changes in gender spaces are an interplay of geo-social and economic gender structure and conditions with drivers of change. However these changes in gender spaces are not reflected in formal and informal institutions and policies which in turn is a barrier for gender transformative change. The paper by Udas et al. on the case of Gandaki basin shows the intersectionality of various gender social groups. It elaborates how changes in gender roles as a way to respond to climatic and socioeconomic stressors is not supported by institutional practices, mechanisms and policies that still remain patriarchal. Consequently, there is increased incidences of violence against women and children, which remain as root cause of increased vulnerabilities.

**Fourth**, women's knowledge about changing climatic and environmental systems are mostly in the form of lived experiences and have been passed on from one generation to other in the form of local knowledge (Crate, 2011). This knowledge system works in parallel with the so-called scientific knowledge system (Agrawal, 1995). The case from Bihar, India by Acharya and Prakash documents the gendered process by which local knowledge is produced through complex interaction between fine grained observations and official early warning systems. It also explores how communities living with flood practice knowledge innovation by making generic and centralized flood forecasting information locally applicable, through triangulation. The paper argues that local knowledge coming from the experiences of the most vulnerable should be recognized. Strengthening local knowledge systems on flood forecasting can work to counterbalance the drawbacks of centralized flood early warning systems, as this would ultimately benefit women, children and elderly who spend most of their time in flood prone areas as their men go out to earn for the families. It can also shift the discourse on flood forecasting to recognize the role of communities as producers of meteorological and flood related knowledge. The production and consumption of flood forecasting knowledge needs local and scientific communities to work together for reducing knowledge gaps at both ends and women's knowledge is central to this process.

**Lastly**, gendered vulnerabilities are also shaped by geography, scale and political structure apart from different social structures, norms, values and patriarchy stated earlier. The paper by Goodrich and Namchu, highlights the vulnerabilities shaped by ethnic identity, political affiliations and the resources that can be mobilised through political networks. The paper explores the varied narratives of vulnerabilities faced by different groups of people in Darjeeling mid hills region in West Bengal, having different livelihoods but almost similar social, historical and cultural contexts. The paper by Sharma et al. on Sikkim presents multidimensional gendered vulnerabilities at different altitudes. The authors argue that people living in high and mid altitudinal regions are differentially affected to climate extremes as issues and priorities driving sensitivities also change with location and altitude. Institutions like women's self-help groups are crucial for adaptation that build social capital to cope with stressors. Bhadwal et al. present the case of Upper Ganga Basin that has experienced many extremes over the period with direct and indirect impacts on livelihoods and increasing risks. The paper presents perceptions of the communities on what is causing changes and how they are affecting the communities differentially. Paper by Udas et al. and Abbasi et al. bring in basin perspective of gendered vulnerabilities and adaptation respectively in Gandaki and Indus river basin.

#### 4. Gendered vulnerabilities in the HKH

It is clear that prevalence of poverty, exclusions and gender disparities are high in the HKH and people experience differential vulnerabilities shaped by an intersection of class, caste, gender, age, marital status, health, profession and others. From all the papers based on the field research the key findings and conclusions across the HKH sites are:

##### 4.1. *Changing genderscapes*

Climatic stressors and socio-economic changes have increased vulnerabilities among farm families having limited socioeconomic resources. There is a trend where young men are moving out of the villages in search of alternate income to cope with farm failure and related economic deprivations. As a result, genderscapes are changing that is reflected in changes in demography, altering of gender roles, shifting spaces of women and men and transitions in the gender and social relations.

##### 4.2. *Increased vulnerabilities of women and children*

Women are left behind in climatically stressful environments with not only household and care responsibilities but also with the responsibilities of the farm and of dealing with "outside" work that were hitherto the domain of men. Thus, there is a drastic increase in women's workload that adds a big vulnerability to women and children in terms of health and time poverty. Moreover, they face security issues not only because they do not have menfolk in their families but also more due to their engagement in the public domain. This is specifically due to lack of measures or capacity to utilize existing measures of safeguard against violence to women and children. Even where there are mechanisms, women do not have the power or the status to reach or utilize these mechanisms. Our studies have observed cases of violence to women and children in public space in the study areas.

##### 4.3. *Enhanced capacity of women*

Being pushed into new roles, domain and spaces, women's skills and capacities have increased. Women are taking on roles and responsibilities in all spheres and in all domains (private and public) and have gradually gained capacities and skills to negotiate in public space. This provides a huge opportunity whereby institutions could step in and provide the enabling environment with gender sensitive institutional practices and policies to support women as leaders and not just beneficiaries, which would add to resilience building.

##### 4.4. *Unchanging institutions and policies*

Though women's new roles in economic and public domains have strongly increased with their engagement in microenterprises, marketing, saving and credit groups, as well as dealing with disasters, their involvement in decision making bodies remains minimal. The reason is that institutional structures and processes remain patriarchal and largely male dominated. Thus, our findings suggest

that institutions curtail women's agency as the institutional structures and processes remain patriarchal and largely male-dominated. This strongly suggests that negation of women's agency is an institutional outcome.

Thus the changing climate and socio-economic conditions in the HKH has led to major changes in experiences of the various groups of people, as also changes in the genderscapes itself. What is clear is that such changes and impacts differ based on gender as well as other categories mentioned above, not to rule out the interplay and interlinkages of these categories. Consequently, what comes out is a myriad of impacts across the region and peoples, some of which seem familiar and quite similar while some are unique to the location or group of people, showing the importance of contextual situations, despite common general climate and socio-economic changes. Thus, the papers link, as Jasenoff (2010, p. 235) puts it, "abstract generalizations, specificity and objectivity" of climate science with contextually relevant social changes, experiences, and subjectivities" by bringing out empirical evidences of people's experiences in regard to livelihoods, resource access, changes in quality of their lives in the face of climate change and specific socio-economic changes in the areas.

## References

- Alway, J., Belgrave, L.L., Smith, K.J., 1998. Back to normal: gender and disaster. *Symb. Interact.* 21 (2), 175–195.
- Agrawal, A., 1995. Dismantling the Divide Between Indigenous and Scientific Knowledge. *Dev. Chang.* 26 (3), 413–439 International Institute of Social Studies. The Hague.
- Arora-Jonsson, S., 2011. Virtue and vulnerability: discourses on women, gender and climate change. *Glob. Environ. Chang.* <https://doi.org/10.1016/j.gloenvcha.2011.01.005>.
- Behrman, N., 2010. The Waters of the Third Pole: Sources of Threat, Sources of Survival, Argument.
- Blaikie, P., Cannon, T., Davis, I., Wisner, B., 2014. At Risk: Natural Hazards, People's Vulnerability and Disasters. Routledge.
- Blaikie, P.M., Cameron, J., Seddon, D., 2000. The Struggle for Basic Needs in Nepal. Adroit Publishers.
- Blaikie, P.M., Sadeque, S.Z., 2000. Policy in High Places: Environment and Development in the Himalayan Region. International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal.
- Brody, A., Demetriades, J., Esplen, E., 2008. Gender and Climate Change: Mapping the Linkages: A Scoping Study on Knowledge and Gaps. BRIDGE, Institute of Development Studies (IIDS), UK.
- Crate, S.A., 2011. Climate and culture: anthropology in the era of contemporary climate change. *Annu. Rev. Anthropol.* 40, 175–194.
- Das, N.R., 2009. Human development report 2007/2008 fighting climate change: human solidarity in a divided world, UNDP, New York. *Social Change* 39 (1), 154–159.
- De Souza, K., Kituyi, E., Harvey, B., Leone, M., Murali, K.S., Ford, J.D., 2015. Vulnerability to climate change in three hot spots in Africa and Asia: key issues for policy-relevant adaptation and resilience-building research. *Reg. Environ. Chang.* 15, 747–753. <https://doi.org/10.1007/s10113-015-0755-8>.
- Eakins, H., Luers, A.L., 2006. Assessing the vulnerability of social-environmental systems. *Annu. Rev. Environ. Resour.* 2006 (31), 365–394.
- Enarson, E.P., 2012. Women Confronting Natural Disaster: From Vulnerability to Resilience. CO: Lynne Rienner Publishers, Boulder.
- Enarson, E., Chakrabarti, P.D. (Eds.), 2009. Women, Gender and Disaster: Global Issues and Initiatives. SAGE Publications, India.
- Esteve-Volart, Berta, 2004. Gender Discrimination and Growth: Theory and Evidence from India, Vol., pp. -. 2004. Available at SSRN: <<https://ssrn.com/abstract=1127011>>. (Accessed 2 November 2018).
- Elalem, S., Pal, I., 2015. Mapping the vulnerability hotspots over Hindu-Kush Himalaya region to flooding disasters. *Weather Clim. Extrem.* 8, 46–58. <https://doi.org/10.1016/j.wace.2014.12.001>.
- Gerlitz, J.Y., Hoermann, B., Hunzai, K., 2011. Understanding Mountain Poverty in the Hindu Kush-Himalayas: Regional Report for Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan, Case Study. IFAD, Kathmandu, Nepal.
- Goodrich, C.G., Mehta, M., Bisht, S., 2017. Status of Gender, vulnerabilities and adaptation to climate change in Hindu Kush Himalaya: impacts and implications for livelihoods and sustainable mountain development, ICIMOD Working Paper 2017/3, Kathmandu, ICIMOD.
- Gustafson, P.E., 1998. Gender differences in risk perception: theoretical and methodological perspectives. *Risk Anal.* 18 (6), 805–811.
- HDR, 2016. Human Development for Everyone. United Nations Development Programme, USA.
- Hewitt, F., 1989. Woman's work, woman's place: the gendered life-world of a high mountain community in northern Pakistan. *Mt. Res. Dev.* 335–352.
- ICIMOD, 2015. The Himalayan Climate and Water Atlas: Impact of Climate Change on Water Resources in Five of Asia's Major River Basins. International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal.
- ICIMOD, 2011. Draft Regional Report Hindu Kush – Himalaya Sustainable Mountain Development Hindu Kush Himalaya (HKH) Region. Development.
- Jasanoff, S., 2010. A new climate for society. *Theory, Cult. Soc.* 27 (2–3), 233–253.
- Kapadia, K., 1995. Siva and Her Sisters: Gender, Caste, and Class in Rural South India. Westview Press, Inc.
- Kelkar, G., 2009. The Feminization of Agriculture in Asia: Implications for Women's Agency and Productivity [WWW Document]. Extension Bulletins Food Fertiliser Technical Centre.
- Khanal, N., Watanabe, T., 2006. Abandonment of agricultural land and its consequences: a case study in the Sikles area, Gandaki basin, Nepal Himalaya. *Mt. Res. Dev.* 26, 32–40. [https://doi.org/10.1659/0276-4741\(2006\)026\[0032:AOALAI\]2.0.CO;2](https://doi.org/10.1659/0276-4741(2006)026[0032:AOALAI]2.0.CO;2).
- Kilroy, G., 2015. A review of the biophysical impacts of climate change in three hotspot regions in Africa and Asia. *Reg. Environ. Chang.* <https://doi.org/10.1007/s10113-014-0709-6>.
- Kraaijenbrink, P.D.A., Bierkens, M.F.P., Lutz, A.F., Immerzeel, W.W., 2017. Impact of a global temperature rise of 1.5 °C on Asia's glaciers. *Nature* 549, 257.
- Luintel, Y.R., 2004. Gender relations in polyandry in Nepal Himalaya. *Contrib. Nepal. Stud.* 31, 43–83.
- Lutz, A., Immerzeel, W.W., Bajracharya, S.R., Litt, M., Shrestha, A., 2016. Impacts of Climate Change on the Cryosphere, Hydrological Regimes and Glacial Lakes of the Hindu Kush Himalayas: A Review of Current Knowledge, Research Report. International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal.
- Lutz, A.F., ter Maat, H.W., Wijngaard, R.R., Biemans, H., Syed, A., Shrestha, A.B., Wester, P., Immerzeel, W.W., 2018. South Asian river basins in a 1.5 °C warmer world. *Reg. Environ. Chang.* <https://doi.org/10.1007/s10113-018-1433-4>.
- McCaffery, E., 1993. Slouching towards equality: gender discrimination, market efficiency, and social change. *Yale Law J.* 103 (3), 595–675. <https://doi.org/10.2307/797082>.
- McOmber, C., Panikowski, A., McKune, S., Bartels, W.-L., Russo, S., 2013. Investigating Climate Information Services through a Gendered Lens. CGIAR Res. Prog. Clim. Chang. Agric. Food Secur.
- Nelson, V., Meadows, K., Cannon, T., Morton, J., Martin, A., 2002. Uncertain predictions, invisible impacts, and the need to mainstream gender in climate change adaptations. *Gend. Dev.* <https://doi.org/10.1080/13552070215911>.
- Nelson, S., Lambrou, Y., 2008. People-centred climate change adaptation: integrating gender issues. Food and Agriculture Organization Briefing Paper, Gender, Equity and Rural Employment Division (ESW).
- Ostrom, E., 2000. Collective action and the evolution of social norms. *J. Econ. Perspect.* 14, 137–158.
- Parikh, J., 2007. Gender and Climate Change Framework for Analysis, Policy and Action.
- Pasteur, K., 2011. From Vulnerability to Resilience: A Framework for Analysis and Action to Build Community Resilience. Practical Action Publishing, Rugby.
- Patt, A.G., Dazé, A., Suarez, P., 2009. Gender and climate change vulnerability: what's the problem, what's the solution. The Distributional Effects of Climate Change:

- Social and Economic Implications. pp. 82–102.
- Rasul, G., 2014. Food, water, and energy security in South Asia: a nexus perspective from the Hindu Kush Himalayan region. Environ. Sci. Policy. <https://doi.org/10.1016/j.envsci.2014.01.010>.
- Rasul, G., Hussain, A., Sutter, A., Dangol, N., Sharma, E., 2016. Towards an integrated approach to nutrition security in the Hindu Kush Himalayan Region, Working Paper. International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal.
- Resurrección, B.P., et al., 2019. In the shadows of the Himalayan Mountains: persistent gender and social exclusion in development. In: Wester, P., Mishra, A., Mukherji, A., Shrestha, A. (Eds.), *The Hindu Kush Himalaya Assessment*. Springer, Cham.
- Scoones, I., 2009. Livelihoods perspectives and rural development. J. Peasant Stud. <https://doi.org/10.1080/03066150902820503>.
- Sherpa, D., 2007. New Vulnerabilities for Mountain Women: A Different Light on the Greater Himalaya.
- Speck, S., 2017. They moved to city areas, abroad. Mt. Res. Dev. 37, 425–435.
- Stocker, T.F., Qin, D., Plattner, G.K., Tignor, M.M.B., Allen, S.K., Boschung, J., Nauels, A., Xia, Y., Bex, V., Midgley, P.M., 2013. Climate Change 2013 the Physical Science Basis: Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Climate Change 2013 the Physical Science Basis: Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. <https://doi.org/10.1017/CBO9781107415324>.
- Tucker, J., Daoud, M., Oates, N., Few, R., Conway, D., Mtisi, S., Matheson, S., 2015. Social vulnerability in three high-poverty climate change hot spots: what does the climate change literature tell us? Reg. Environ. Chang. 15, 783–800. <https://doi.org/10.1007/s10113-014-0741-6>.
- Wester, P., Mishra, A., Mukherji, A., Shrestha, A.B., 2018. *The Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People*. Springer International Publishing.
- World Economic Forum. 2017. The Global Gender Gap Report 2017. World Economic Forum, Cologny/Geneva Switzerland.